Deepwater Horizon / Mississippi Canyon 252 Oil Spill
Natural Resource Damage Assessment

TECHNICAL REPORT: Estimation of avian mortality in regions not included in the Shoreline Deposition Model

Prepared by the U.S. Department of the Interior, Fish and Wildlife Service
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The Trustees used a Shoreline Deposition Model (SDM) to estimate injury to birds as part of the *Deepwater Horizon* (DWH) Oil Spill Natural Resource Damage Assessment (Industrial Economics 2015). The SDM relies on data for search effort (documented systematic *searches* for dead or impaired birds by spill responders) and bird recoveries (the documented *collection* of dead or impaired birds by spill responders), along with other data, to estimate bird mortality. Due to the large geographic extent of the spill and the diversity of habitats across the area affected by the spill, the SDM estimates mortality for discrete geographic areas (called Regions). Regions were delineated based on general geographic location and habitat similarities. Due to limitation in response resources and the vast area impacted by the spill, three Regions (Lake Mechant, Vermilion Bay, LA, and Breton-Chandeleur Islands, LA; Figure 1) were infrequently searched by spill responders and, therefore, lacked sufficient search effort and bird recovery data to estimate mortality using the SDM. However, based on the documented occurrence of oil on water and shorelines, the collection of oiled bird carcasses during response activities, and the recovery of oiled and/or impaired live birds in each of these Regions, there is evidence that bird mortality occurred in these Regions. Nevertheless, the limited amount of search and collection data for these Regions prevented estimation of bird mortality with the SDM. Therefore, the SDM excluded these Regions, referred to as "Excluded Regions," when modeling the nearshore (<40km) mortality estimate.

This Technical Report addresses an alternative method, primarily spatial extrapolation from Regions with similar shoreline characteristics, for estimating bird mortality in the Excluded Regions. The general approach was to apply "mortality rates" (discussed below) from adjacent Regions with similar habitat characteristics that were modeled in the SDM to total shoreline length of the Excluded Regions to estimate the total bird mortality in the Excluded Regions during the SDM period (start of the DWH Oil Spill to September 30, 2010). The bird "mortality rate" for a Region included in the SDM is defined as the total mortality estimate generated by the SDM for that Region divided by the total shoreline length (kilometers) in that Region. The total mortality estimate generated by the SDM includes adjustments to account for carcasses lost at sea (IEc2015b). The SDM results were presented in the technical report *Avian Injury Quantification using the Shoreline Deposition Model* (IEc 2015).

The conceptual approach was applied to each of the three Excluded Regions but required Region-specific adjustments, as described below.

Lake Mechant

The Lake Mechant Excluded Region is located in Louisiana between Terrebonne Bay to the east and Vermilion Bay to the West. Although some surveys for dead and debilitated birds were conducted in this Region, sufficient search effort and bird collection data exist for only about 10 percent (25 km) of the shoreline in this Region. For the 25 km of the Lake Mechant shoreline for which sufficient data existed, the SDM estimated a mortality rate ranging between 1.8 and 4.6 birds/km for the model period (between 45 and 116 birds). These mortality rates were then applied to the remaining 233 km of potentially affected shoreline in the Region to estimate the additional number of birds killed within Lake Mechant (Table 1). The proportions of marsh and beach habitats in both the modeled and un-modeled shorelines in this region were similar (approximately 90 percent marsh and 10 percent beach habitat).

Vermilion Bay

The Vermilion Bay Excluded Region is located in Louisiana between the Lake Mechant Region to the east and the North Texas – West Louisiana Region to the west. The mortality rates for the Lake Mechant Region (ranging between 1.8 and 4.6 birds/km) were applied to the total length (km) of the shoreline in the Vermilion Bay Region to estimate the total bird mortality (Table 1). Lake Mechant shorelines consist of a similar mix of marsh edge and sand beach habitats (e.g, more than 90 percent of the shoreline in each region consists of marsh edge habitats). Although, Vermillion Bay is west of Lake Mechant and further from the spill source and one may infer that deposition rates would be lower, the mortality rates for the North Texas/West Louisiana Region (further west than Vermillion Bay) were comparable to the mortality rates applied (ranging between 2.6 to 3.6 birds/km).

Breton-Chandeleur Islands

The Breton - Chandeleur Islands Excluded Region includes a series of islands east of Louisiana's Mississippi Delta. Bird mortality in the Breton - Chandeleur Islands was estimated by applying the SDM bird mortality rates from the Mississippi - Alabama Gulf Islands Region (ranging between 18.0 and 25.8 birds/km) to the total shoreline length (kilometers) in the Breton - Chandeleur Islands (Table 1). Because the Breton-Chandeleur Islands are closer to the source of the spill than the Mississippi - Alabama Gulf Islands Region, mortality estimates using this method may be underestimated.

References

Industrial Economics, Incorporated (IEc). 2015. *Deepwater Horizon*/Mississippi Canyon Oil Spill Natural Resource Damage Assessment Technical Report: Quantification of Nearshore Avian Mortality using the Shoreline Deposition Model and Lost at Sea Factor. Prepared for the Deepwater Horizon Natural Resource Damage Assessment and Restoration Program, U.S. Fish and Wildlife Service, U.S. Department of the Interior. September 1, 2015.

Table 1. Estimated bird mortality in three geographic Regions for which estimates were not be derived using the Shoreline Deposition Model (SDM). The Regions include Lake Mechant, Vermilion Bay, and the Breton-Chandeleur Islands.

Region	Shoreline Length (km)	Low Estimate[1]		High Estimate[1]	
		Mortality Rate (bird/km)	Estimated Bird Mortality	Mortality Rate (bird/km)	Estimated Bird Mortality
Lake Mechant	233	1.8	419	4.6	1,072
Vermilion Bay	753	1.8	1,355	4.6	3,464
Breton-Chandeleur	101	18.0	1,818	25.8	2,606
Total			**3,592**		**7,142**

[1] Mortality estimates will be adjusted to account for species that will be excluded from injury quantification (IEc 2015).

Figure 1. Map of three geographical regions for which bird mortality resulting from the *Deepwater Horizon* oil spill was not estimated using the Shoreline Deposition Model (IEc 2015).